

REMARKS

Claims 10-21 are currently pending in the application. By this amendment, claims 10, 11 and 18 are amended. Additionally, by this amendment, claims 19-21 are added for the Examiner's consideration. Support for the amendment(s) and the added claims are provided in at least Figures 1 and 2A and at page(s) 12-15 of the present specification. No new matter is added. Reconsideration of the rejected claims in view of the above amendments and the following remarks is respectfully requested.

Examiner Interview

Applicants appreciate the courtesies extended by the Examiner to Applicants' undersigned representative during a personal interview conducted on July 27, 2004. During this interview, the distinguishing features of the claimed invention were discussed. The Examiner indicated that further consideration would be given to these distinguishing features. In addition to further comments, the pertinent points of the interview are discussed below.

35 U.S.C. §112 Rejection

Claims 11 and 18 were rejected under 35 U.S.C. §112, 2nd paragraph. This rejection is respectfully traversed.

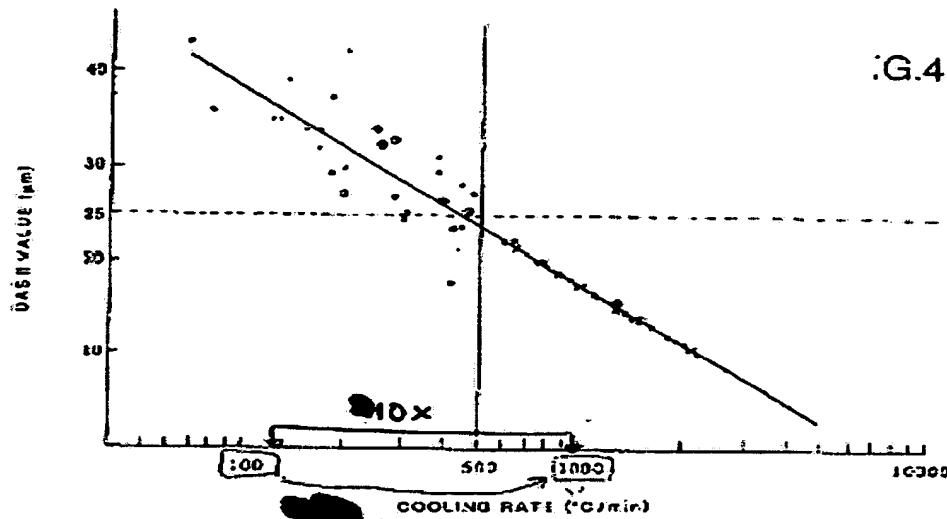
Claims 11 and 18 are amended to address the Examiner's concerns. These amendments are not narrowing amendments and are made to expedite the prosecution of the application. Accordingly, Applicants respectfully request that the rejection over claims 11 and 18 be withdrawn.

35 U.S.C. §102/§103 Rejections

Claim 10 is rejected under 35 U.S.C. §102(b) over Butler et al. Claims 16 and 18 are rejected under 35 U.S.C. §103(a) over Butler. Claims 11-13 are rejected under 35 U.S.C. §103(a) over Butler in view of Gotheridge. Claims 14 and 15 are rejected under 35 U.S.C. §103(a) over

Butler in view of Gotheridge and Wittmoser. Claim 17 is rejected under 35 U.S.C. §103(a) over Butler in view of Khandros. These rejections are respectfully traversed.

As discussed during the interview, the claimed invention provides great advantages over conventional systems. For example, due the structure of the claimed invention, the solidification speed is faster and crystalline size is smaller than that of conventional systems and methods, as shown generally in the graph reproduced below.



Applicants additionally bring to the Examiner's attention to the fact that the present system provides approximately 10 times greater difference than that of the conventional method and systems of casting. Also, a higher rate of solidification in certain areas is due to the molten metal contacting the walls of the mold, itself. Further, the reducing compound reduces oxide film on the molten metal to provide for a greater fluidity during the casting process.

Additionally, as supported in the present specification and as shown in Figure 3A, the cooling rate fully secures the difference of solidification time of the molten metal between the feeder head portion and the cavity. This is akin to setting the cooling rate difference of 200°C/min or more, as recited in claim 18, for example. With these features,

1. the molten metal filled in the feeder head portion can sufficiently exert an effect of feeding the molten metal which flows into the cavity portions compared to the related art; and

2. the solidification in the cavity and the feeder is less than 25 μm at an average. The fact that the space between such dendrites is small indicates that a crystal structure of the metal is dense which increases mechanical strength and enhances the product.

Butler, on the other hand, shows a molding die with a refractory sleeve and use of a refractory filter. However, there is no indication, whatsoever, that the molding die includes the features of the claimed invention, including the cooling rates and differences thereof. There is simply only disclosure that the molding die can have a refractory sleeve. In fact, it is only after considerable experimentation that Applicants have solved many of the problems of the known prior art including, for example, reducing crystalline size of the metal in order to dramatically improve the cast by such cooling rate differences.

Gotheridge describes the use of a sand mold with refractory pads placed at certain areas within the mold. However, again, this reference does not show the features of the independently claimed invention, nor would one of ordinary skill be able to practice the specifics of the invention by reading this reference. For example, even though there are refractory pads placed within the mold, there is no teaching or suggestion that such configuration can achieve a cooling rate of the molten metal filled in an area of the cavity is at about 500°C/min. or more and a cooling rate of molten metal poured into the feeder head portion is at about 500° C/min. or less.

Again, Applicants submit that it was only after extensive experimentation that the inventors achieved the claimed invention and accompanying advantages. This claimed feature certainly is not suggested or taught in the Gotheridge reference. Also, Applicants respectfully submit that it would only be through impermissible hindsight reasoning, after reading and

understanding Applicants' disclosure, that one of ordinary skill in the art would be able to achieve the claimed invention by reading the Gotheridge reference.

Wittmoser and Khandros also do not show the features of the claimed invention. For example, Wittmoser shows an insulator layer 56 formed within the mold of Figure 5, for example. But, this reference still does not show the features of the independently claimed invention.

As to claim 17, Khandros teaches the use of a non-oxidizing gas being introduced into the cavity of the mold through a separate passage. However, the non-oxidizing gas is not a reducing compound; instead it is similar to the argon gas, for example, which may be used by the invention. The reducing compound of Applicants' invention, in which raw materials are supplied into the cavity to produce the reducing compound in the cavity is simply not shown in the Khandros reference.

Accordingly, Applicants respectfully request that the rejections over claims 10-18 be withdrawn.

Added Claims

Claims 19-21 are added for the Examiner's consideration. Claim 19 is an independent claim and is allowable for the reasons set forth above. The remaining added claims are dependent on the distinguishable independent claims and are also in immediate condition for allowance.

--10--

CONCLUSION

In view of the foregoing amendments and remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 23-1951.

Respectfully submitted,



Andrew M. Calderon
Registration No. 38,093

McGuireWoods, LLP
Suite 1800
1750 Tysons Blvd.
McLean, VA 22102
(703) 712-5426